

99.9% Spin-Flip Efficiency in the Presence of a Strong Siberian Snake*

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We recently studied the spin-flipping efficiency of an rf-dipole magnet using a 120-MeV horizontally polarized proton beam stored in the Indiana University Cyclotron Facility Cooler Ring, which contained a nearly full Siberian snake. We flipped the spin by ramping the rf dipole's frequency through an rf-induced depolarizing resonance. By adiabatically turning on the rf dipole, we minimized the beam loss, while preserving almost all of the beam's polarization. After optimizing the frequency ramp parameters, we used up to 400 multiple spin flips to measure a spin-flip efficiency of $99.93 \pm 0.02\%$. This result indicates that spin flipping should be possible in very-high-energy polarized storage rings, where Siberian snakes are certainly needed and only dipole rf-flipper magnets are practical.

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